

(19)



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Office européen des brevets



(11)

**EP 0 518 873 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
05.06.1996 Bulletin 1996/23

(51) Int Cl.<sup>6</sup>: **G08B 26/00**

(86) International application number:  
PCT/GB91/00160

(21) Application number: **91903213.6**

(87) International publication number:  
WO 91/14245 (19.09.1991 Gazette 1991/22)

(22) Date of filing: **04.02.1991**

**(54) SECURITY ARRANGEMENT**

**SICHERHEITSANORDNUNG**

**DISPOSITIF DE SECURITE**

(84) Designated Contracting States:  
**AT BE CH DE DK ES FR GB GR IT LI LU NL SE**

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(30) Priority: **03.03.1990 GB 9004828**  
**18.10.1990 GB 9022698**

(43) Date of publication of application:  
23.12.1992 Bulletin 1992/52

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## Description

This invention relates to a building security arrangement as claimed in the preamble of claim 1. Such an arrangement is known from GB-A-2 215 387. The invention is characterized by the features claimed in the characterizing portion of claim 1.

A particular advantage of the present invention is that the control module successively interrogates the stations and in that a station is arranged to receive a signal from the first adjacent station, to modify said signal to indicate the status of the station and to transmit the signal to a second adjacent station.

This means that the control module does not have to directly transmit to each of the stations, as transmission occurs between adjacent stations. This results in low power consumption.

Further, the successive interrogation of the stations allows the integrity of the system to be constantly monitored, and not merely checked at specific times.

Also, it is not easy to interfere with the system by, for example, inserting a dummy station to replace a broken lock because the dummy station will not be able to transmit the expected signal to the next adjacent station.

In addition, it is not easy to jam the system because if jamming occurs, signals will be received at the wrong time, or incorrect signals will be received by one or more stations. This will result in the alarm being activated.

The locks may be fitted to closures including doors, windows and the like, the alarm being responsive to unauthorised opening of the closure. The alarm may also be arranged to indicate whether the stations are in a desired condition, for example, whether the door or windows of a building are closed but not necessarily locked.

In an alternative embodiment of the invention the station may communicate with the control module by means of electrical or fibre optic conductors.

The stations are arranged so that a first station receives a signal from the control module performs a function upon receipt of the signal, passes the signal to an adjacent station which in turn performs the function before relaying the signal to a third station, the signal being relayed to each station in turn and then returned to the control module to complete the cycle.

In use the signal emitted from the control module is modified by each station in turn so that the signal returned to the module after each complete cycle provides an indication of the status of all of the stations. The frequency with which the signals are emitted by the module and their direction around the circuit may be varied either at random or in accordance with a predetermined sequence. This serves to frustrate attempts to interfere with the signals, for example by insertion of a dummy station to replace a broken lock.

The alarm may be actuated by receipt of a single incorrect signal. Preferably the module is arranged to interrogate each station frequently, for example every few seconds, and the alarm is not being actuated until

the incorrect signal has been confirmed several times. This serves to reduce the incidence of false alarms.

The security arrangement of the present invention confers a considerable number of advantages. The RF transceivers need only have a low power and minimal range, avoiding any interference with external equipment and any necessity for a broadcasting licence. The signal may be modified as it is received by each station so that the control module receives a discrete indication of the status of each lock or other function performed by the station. Thus a fault or alarm condition may be correlated with the station concerned, allowing rapid identification and correction of any security hazard. Deactivation or removal of a station from the circuit would also cause actuation of the alarm.

In preferred aspects of the invention a station including an RF transceiver may be attached to or placed in a valuable article located in the vicinity of the RF circuit, but not necessarily secured to a lock assembly. Such articles may include a car, boat, caravan or for a building such as a garage which is remote from the main building. Removal of a car for example from the vicinity of the central module would thus cause actuation of the alarm. Similarly the station may be adapted to be connected to an electrical circuit of the vehicle, for example the ignition circuit or an existing alarm arrangement to provide a remote indication that the vehicle has been tampered with by an unauthorised person. Thus the person may not be alerted by the presence of an audible alarm increasing the likelihood of his apprehension. Alternative articles to which the station may be attached are valuable electrical items such as video recorders, television sets, and the like. In such circumstances the transceiver may be adapted to transmit a signal through the mains supply to the building, avoiding the need for an RF circuit and also providing an alarm if the mains supply to the article is interrupted. The station may be integral with the mains supply connector.

The controller of the present invention may be arranged to communicate with a radio pager or other apparatus remote from the building. A telephone unit may be provided so that the control module can be interrogated by means of a telephone call from a remote location. This affords the benefit that a security monitoring service may be provided to check the integrity of the security system while the owner is absent, for example abroad on holiday. The frequency of interrogation of the circuit may be selected as desired, a brief telephone call being all that is necessary to ascertain the status of the security system.

The key used to gain access to the building or other closure within the security circuit may contain an integral RF unit arranged to deactivate the alarm as the key is brought into the proximity of the lock. This avoids any necessity for a user to manipulate the alarm each time they enter or leave the house. This feature provides a clear benefit for elderly or otherwise infirm person who may not remember to activate the alarm or may not have

the dexterity or desire to do so.

Smoke detectors, petrol vapour or other hazardous compound detectors or passive infra-red proximity detectors or active proximity detectors may be incorporated within the circuit of the present invention.

The control unit may incorporate an integral power supply. The control unit may also incorporate a number of rechargeable batteries suitable for use in replacement of the power supplies for the locking units. The locking units may be arranged to provide a signal when their batteries or other power supplies lose power or require replacement. This avoids any malfunction of the system in the event of exhaustion of the battery supply.

The security system may be arranged to provide various functions dependent on whether the user has left the house. Thus if the alarm is actuated but an external door is not opened and closed, indicating that the house is still occupied, the system may simply lock the ground floor doors and windows, leaving the upstairs bedroom windows free to be opened during the night without actuation of the alarm.

The invention is further described by means of example but not in any limitative sense with reference to the accompanying drawings of which:

Figure 1 is a cross-section through a door lock in accordance with this invention;

Figure 2 is a perpendicular cross section through the door lock of Figure 1;

Figure 3 is a cross-section through a window lock in accordance with this invention;

Figure 4 is a perpendicular cross-section through the window lock of Figure 3; and

Figure 5 is a diagrammatic arrangement in accordance with the invention.

A lock shown in Figures 1 and 2 comprises a casing 1 adapted to be secured to a door by means of screws 2 in conventional manner. A battery 3 is arranged to power a RF transceiver 4 removably secured to the casing 1 by means of a screw fastened panel 5. The motor 6 is arranged to drive a gear 7 by means of a worm screw 8. Actuation of the motor causes rotation of the gear 8 driving a shaft 9 axially of the gear 8 causing engagement or withdrawal of the shaft or latch 9 within a socket 10 disposed in the door frame. Engagement of the shaft 9 within the socket 10 serves to lock the door. A spring 11 acting against a hand grip 12, urges a clutch plate 13 against domed projections 14 upon the gear 8. This provides a slipping clutch arrangement so that when the knob 12 is depressed against the plate 13, the gear 8 may be rotated causing the shaft to be withdrawn or engaged within the recess 10. This serves to provide for manual operation of the lock in the event of a power failure or in other circumstances. A logic circuit 15 is connected to the transceiver 4 by contact pins 16 which engage contacts on the gear 8 to provide signals indicative of the latter being in the open and closed states. Logic

circuit 15 also includes a reed switch or Hall effect sensor responsive to a magnet located in the door frame to provide a signal indicative of the door being closed whether locked or unlocked.

Figures 3 and 4 illustrate a window lock in accordance with this invention. Casing 20 including a removable cover 21, contains a motor 22 arranged to drive an eccentric circular cam 24 located in a socket in a slidable latch 23. A catch 26 adapted to be secured to a window frame includes a rebate 25 to receive the slidable latch 23 when the lock is closed. An RF transceiver and logic circuit 27, accessible by means of the cover 21 controls opening and closing of the lock and is responsive to sensors indicative of the status of the lock. A Hall effect device or reed switch (not shown) contained within the casing 20 is responsive to a magnetic strip (not shown) secured to the window frame, for example beneath the catch 26, to provide an indication of the open or closed status of the window closure.

Figure 5 shows a diagrammatic representation of a security arrangement in accordance with this invention. The building 30 and vehicle 31 are protected by means of a security arrangement comprising a control module 32, alarm 33 and telephone system 34 connected by means of a modem. A lock 35 is secured to the exterior door in conventional fashion. Locks 36, 37, 38 and 39 are secured to respective windows and a burglar alarm 40 is connected to the vehicle 31. In use of the apparatus the control module 32 transmits RF signals to the first station integral with the door lock 35. If the lock is in the desired condition, for example locked if the user is leaving the building or wishes to lock the building up at night, the signal from the module 32 is modified and relayed to the window lock 36. The status of the window lock is checked and the signal relayed to window locks 37 and 38 at which the process is repeated in turn. The signal 38 is then received by the vehicle alarm 40 which checks that the vehicle is in the desired condition. The signal is then transmitted to the window lock 39 and eventually the cycle is completed by reception of the signal by the control module 32. In preferred embodiments of the invention the signal is transmitted around the circuit at frequent intervals, for example every five seconds. Minimal power is consumed because the RF units at each station are only active for a short period. If one of the locks is not in the desired condition, for example if one has been forced open or if the vehicle 31 has been removed from the vicinity of the security arrangement, the controller is arranged to disregard the alarm condition until it has been confirmed by a predetermined number of further signal cycles. The alarm 33 is then actuated. The control module is connected to a telephone by means of a modem 34 or other linkage. This enables the alarm to be directed to a remote location, for example a local police station or other security point. The telephone 34 also allows the status of the security arrangement to be checked by means of a telephone call. Transmission of appropriate signals through the telephone may also al-

low the status of the arrangement to be altered without need for entering the building.

#### Claims

1. A building security arrangement comprising a control module (32), an alarm and a multiplicity of stations at least one station including a lock (35), wherein each lock is arranged to be actuated upon receipt of a signal from the control module and incorporating a detector adapted to provide a signal indicative of the status of the station, the controller being arranged to actuate the alarm upon detection of an unauthorised status of the station, characterised in that the stations (27) are successively interrogated by the control module (32), and in that the station is arranged to receive a signal from a first adjacent station, to modify said signal to indicate the status of the station and to transmit the signal to a second adjacent station.
2. An arrangement as claimed in claim 1, characterised in that each station incorporates an RF transceiver arranged to transmit and receive signals from the control module.
3. An arrangement as claimed in claim 1 or 2, characterised in that a user may actuate the locks upon a single actuation of the control module.
4. An arrangement as claimed in claim 5, wherein the frequency or direction of said signal is varied.
5. An arrangement as claimed in any preceding claim, characterised in that a station is secured to an article selected from the group comprising: a car, boat, caravan and a valuable electrical item.
6. An arrangement as claimed in any preceding claim, characterised in that a station includes a sensor selected from the group comprising: a smoke alarm, a proximity detector and a hazardous compound detector.
7. An arrangement as claimed in any preceding claim, wherein the lock includes a latch actuated in use by a motor, the latch being arranged to be further actuated manually by a slipping clutch.

#### Patentansprüche

1. Sicherheitsanlage für Gebäude, welche einen Überwachungsmodul (32), eine Alarmanrichtung und eine Vielzahl von Stationen enthält, von denen mindestens eine ein Schloß (35) aufweist, wobei jedes Schloß so eingerichtet ist, daß es bei Emp-

fang eines Signals vom Überwachungsmodul betätigt wird, und einen Detektor umfaßt, der geeignet ist, ein Signal abzugeben, welches den Status der Station anzeigt, und wobei die Überwachungseinheit so eingerichtet ist, daß sie die Alarmanrichtung auslöst, sobald ein unerlaubter Status der Station festgestellt wird, dadurch gekennzeichnet, daß die Stationen (27) nacheinander vom Überwachungsmodul (32) abgefragt werden und daß die Station so eingerichtet ist, daß sie ein Signal von einer ersten benachbarten Station empfängt, dieses Signal so modifiziert, daß es den Status der Station anzeigt, und das Signal zu einer zweiten benachbarten Station sendet.

2. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß jede Station einen RF-Sende-Empfänger (Transceiver) aufweist, welcher Signale senden und Signale vom Überwachungsmodul empfangen kann.
3. Anlage nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Benutzer die Schösser durch eine einzige Betätigung des Überwachungsmoduls betätigen kann.
4. Anlage nach Anspruch 2, dadurch gekennzeichnet, daß die Frequenz oder die Richtung besagten Signals verändert wird.
5. Anlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Station an einem Gegenstand der nachfolgenden Gruppe befestigt ist: ein Auto, ein Boot, ein Wohnwagen, ein elektrischer Wertgegenstand.
6. Anlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Station einen Sensor, aus der folgenden Gruppe enthält: ein Rauchmelder, ein Annäherungsmelder, ein Gefahrstoffmelder.
7. Anlage nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Schloß einen Riegel enthält, welcher bei Benutzung durch einen Motor betätigt wird, und wobei der Riegel außerdem manuell über eine Rutschkupplung betätigt werden kann.

#### Revendications

1. Dispositif de sécurité pour bâtiments comprenant un module de commande (32), une alarme et une

pluralité de stations, dont au moins une station comprenant un verrou (35), dans lequel chaque verrou est agencé de manière à être actionné à la réception d'un signal provenant du module de commande et incorporant un détecteur adapté pour fournir un signal indicateur de l'état de la station, le dispositif de commande étant agencé de manière à actionner l'alarme lorsqu'il détecte un état non autorisé de la station, caractérisé en ce que les stations (27) sont successivement interrogées par le module de commande (32), et en ce que la station est agencée de manière à recevoir un signal provenant d'une première station adjacente, à modifier ledit signal afin d'indiquer l'état de la station et transmettre le signal à une seconde station adjacente.

2. Dispositif selon la revendication 1, caractérisé en ce que chaque station comporte un émetteur-récepteur HF agencé de manière à transmettre et recevoir des signaux provenant du module de commande.
3. Dispositif selon la revendication 1 ou 2, caractérisé en ce qu'un utilisateur peut actionner les verrous en un unique actionnement du module de commande.
4. Dispositif selon la revendication 3, dans lequel la fréquence ou la direction dudit signal est modifiée.
5. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce qu'une station est fixée à un article sélectionné dans le groupe comprenant : une voiture, un bateau, une caravane et un appareil électrique de valeur.
6. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce qu'une station comprend un détecteur sélectionné dans le groupe comprenant : un détecteur de fumée, un détecteur de proximité et un détecteur de composé dangereux.
7. Dispositif selon l'une quelconque des revendications précédentes, dans lequel le verrou comprend un loquet actionné lors de l'utilisation par un moteur, le loquet étant agencé de manière à être également actionné manuellement au moyen d'un embrayage coulissant.

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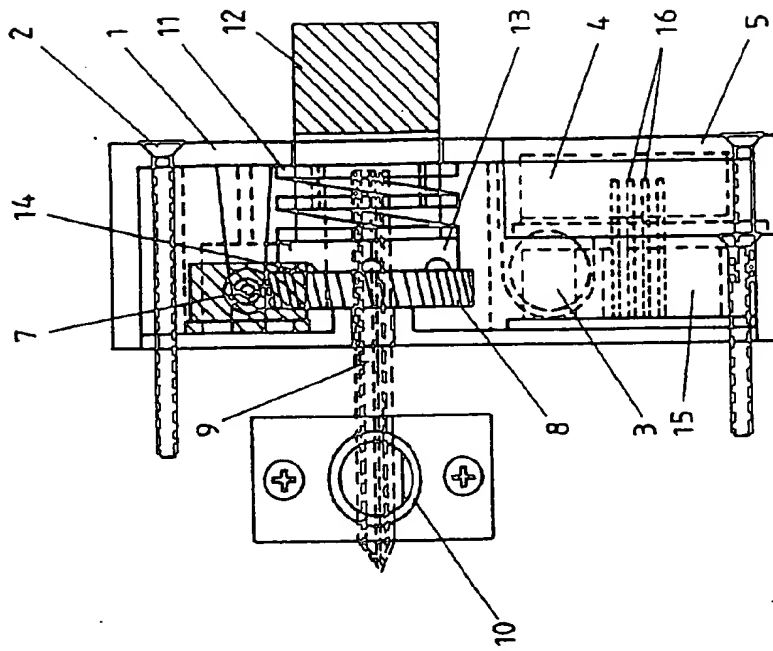


FIG. 2

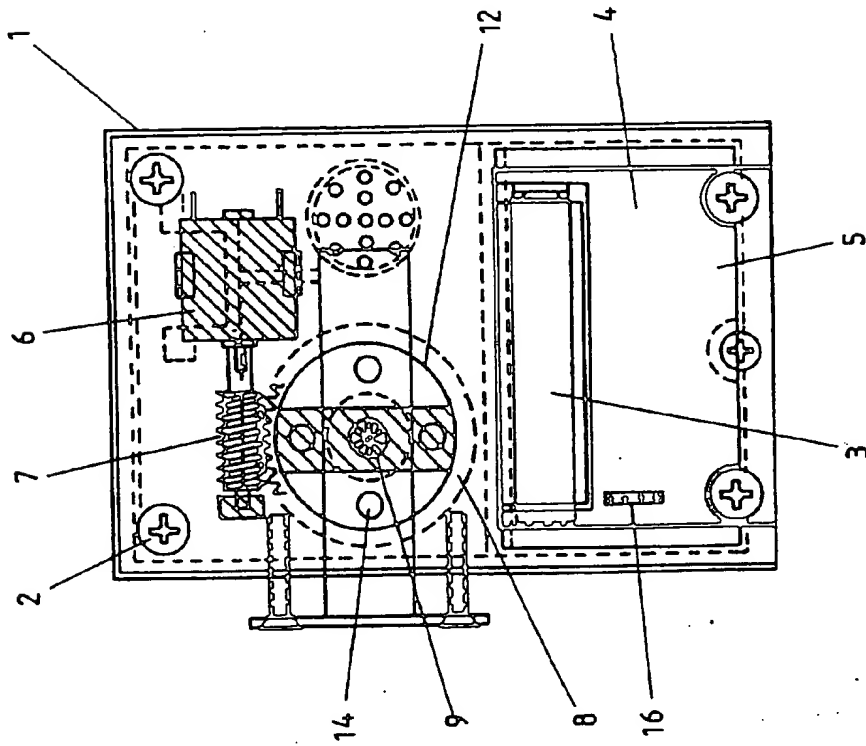


FIG. 1

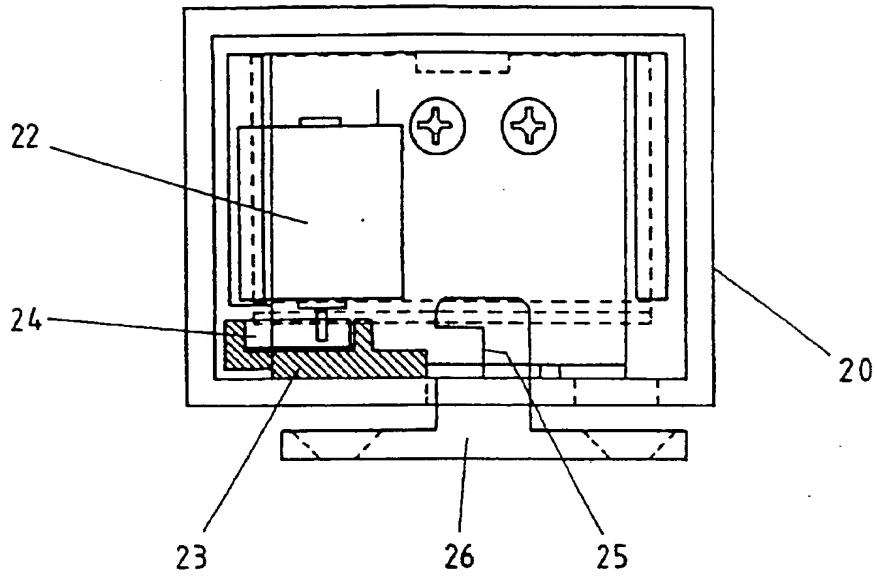


FIG. 3

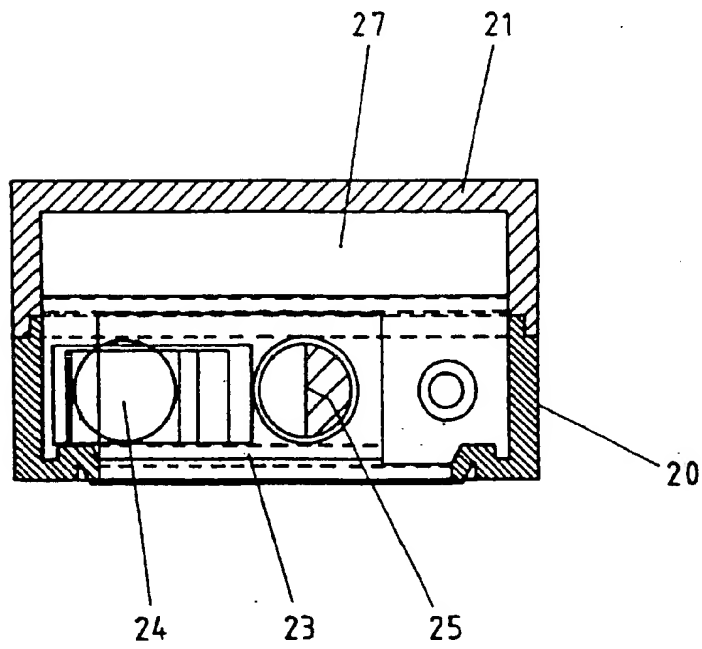


FIG. 4

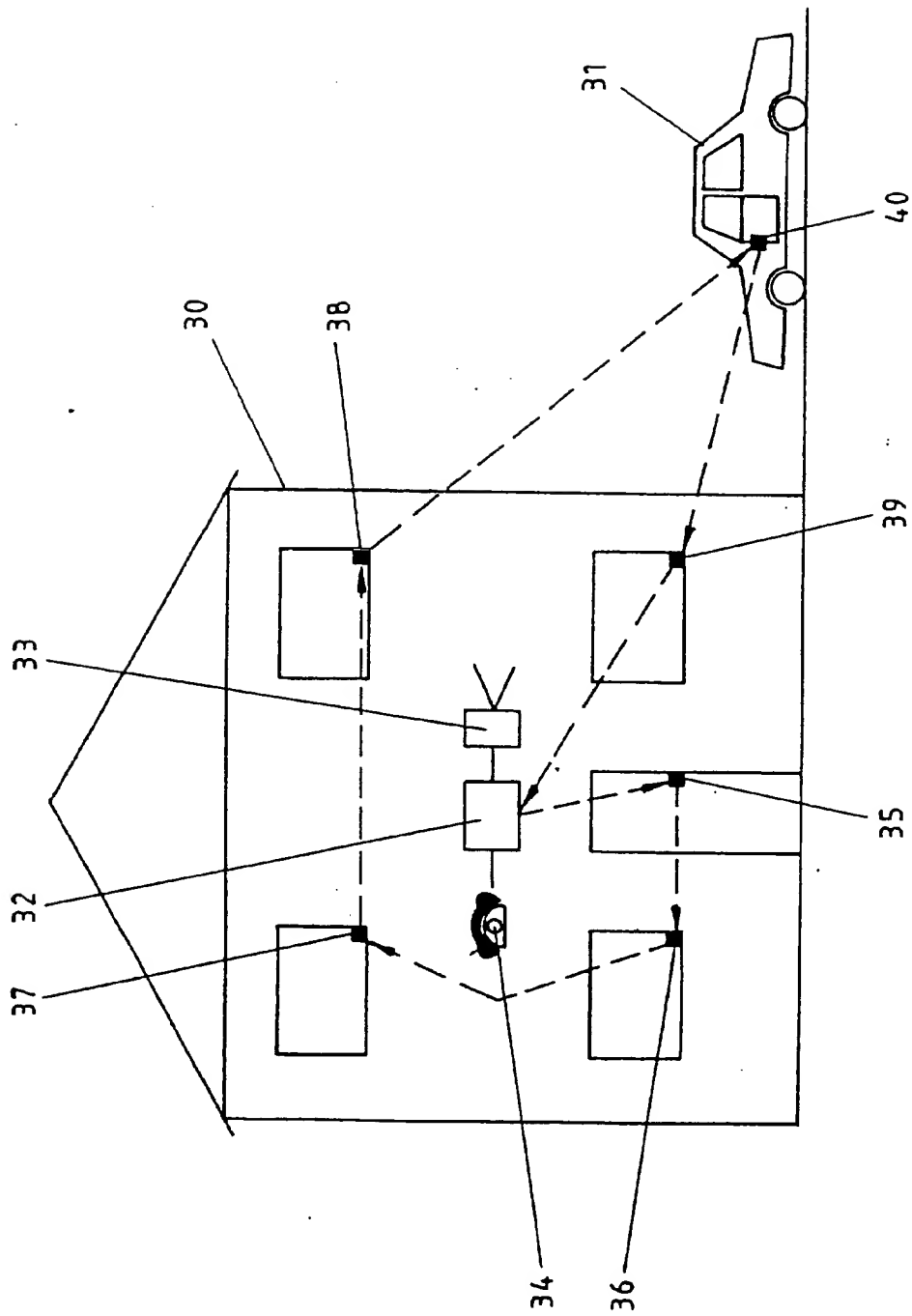


FIG. 5